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# COMPARISON OF EARLY POSTOPERATIVE PAIN FOLLOWING LAPAROSCOPIC CHOLECYSTECTOMY WITH AND WITHOUT PORT SITE & INTRAPERITONEAL BUPIVACAINE

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**Abstract:**

***Objective:*** *to compare mean early postoperative pain score with and without use of port site & intraperitoneal bupivacaine in patients undergoing laparoscopic cholecystectomy under general anaesthesia.*

***Study Design:*** *Randomized controlled trial*

***Setting:*** *Department of Anaesthesia, Mayo Hospital Lahore*

***Duration Of Study:*** *from April 2012 to October 2012.*

***Material & methods:*** *100 patients undergoing laparoscopic cholecystectomy were randomized in two groups (50 in each). Patients in study group(Group-A) received 20ml of intraperitoneal bupivacaine 0.25% and another 20ml of 0.25% bupivacaine for infiltration at port sites(5 ml at each). No intervention was done with patients in study group (Group-B). Assessment of early postoperative pain was done at 0, 2, 4 and 6 hours and two groups were compared.*

***Results:*** *Mean age in the study was calculated as 39.42 ± 4.27 years in group A and 37.88 ± 4.03 years in group B. Regarding gender distribution, 18 %( n=9) in Group-A and 28 %( n=14) in Group-B were males while 82 %( n=41) in Group-A and 72 %( n=36) in Group-B were females. Mean pain score was recorded at 0, 2, 4 and 6 hours postoperatively. Mean pain score at 0 hour was 2.28 ± 0.99 in Group-A and 2.26 ± 0.98 in Group-B; p value was recorded as 0.920, which is insignificant. Similarly, there was no significant difference (p=0.068) between the groups regarding mean pain score at 2 hours which was recorded as 4.580 ± 0.57 in group A and 4.808 ± 0.80 in Group B respectively. Mean pain score at 4 hour was 4.20 ± 0.80 in group A and 5.86 ± 0.94 in group B (p=0.000) while at 6 hour it was 5.02 ± 0.91 in group A and 7.16 ± 1.36 in group B (p=0.000).*

***Conclusion:*** *We concluded that the use of port site and intraperitoneal bupivacaine is simple, safe, non-invasive and effective in decreasing early postoperative pain after laparoscopic cholecystectomy.*

**Keywords:** *Laparoscopic cholecystectomy, early post-operative pain, bupivacaine, mean pain score.*

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## INTRODUCTION:

Laparoscopic Cholecystectomy is a gold standard surgical procedure for symptomatic gall stones. The advantages of laparoscopic surgery include small cosmetic incision, lesser blood loss, reduced postoperative complications with early enteral intake. It allows rapid recovery, short hospital stay and early return to normal life and work activities. However, laparoscopic cholecystectomy is not a pain free technique. [1-3] Pain is more intense within 6 hours and greater analgesia is required in this early period postoperatively. Early postoperative pain relief and patient's comfort is extremely important as it may delay early discharge and decrease cost effectiveness of this procedure. [4-8]

Various analgesic interventions with different mechanisms have been adopted to provide early postoperative pain relief after laparoscopic cholecystectomy but definite conclusions are yet to be made. Control of post operative pain using NSAIDS and opioids come with the side effects like nausea, vomiting, sedation, respiratory depression, compromised renal function and increased risk of bleeding [9]. The idea of intraperitoneal administration of local anaesthetics is on horizon for controlling post operative pain after laproscopic cholecystectomy. It minimizes pain after laparoscopic surgery with safety, efficacy and minimal side effects. [2,6,7]

Amongst local anaesthetics, bupivacaine is widely used and has been subject of many clinical trials with variable analgesic effect. Its half-life is 2.5 to 3.5 hrs and it provides analgesia for an average of 6 hrs. [4,5]

Few studies are available regarding the use of port site & intraperitoneal bupivacaine for the control of pain after cholecytectomy. This study was designed to compare early postoperative pain following laparoscopic cholecystectomy with and without use of port site & intraperitoneal bupivacaine thereby providing the data regarding adequate analgesia after cholecytectomy in our local population. The aim was to find a better technique with reduced side effects for post operative analgesia, enhancing patient comfort with early hospital discharge and reduction of hospital expenses.

## METHODOLOGY:

This Randomized controlled trial was carried out in Department of Anaesthesia, Mayo Hospital Lahore from April 2012 to October 2012. After approval from hospital ethical committee 100 patients undergoing laparoscopic cholecystectomy under general anaesthesia were included in the study (50 in each group) with 95% confidence level,80% power of test taking expected mean pain score (Mean ± SD) in study group(A) 6.08 ± 0.40 as compared to 8.44 ± 0.51 in control group(B). Both male and female patients who were 18 years or above, belonging to ASA class I and II, scheduled to undergo laproscopic cholecystectomy under genral anaesthesia were included. Patients who were excluded from the study were those who had history of allergy to study medications, had previous abdominal surgery or choledocholithiasis and patients who could not properly understand visual analogue scale (VAS). Cases in which laparoscopic surgery was converted to open surgery or intraperitoneal drain wass placed at the end of surgery were also excluded.

Informed written consent was taken from all patients selected during pre-operative anaesthesia assessment carried out a day before surgery.

All patients enrolled in the study were explained in detail about the use of visual analogue scale for evaluation of pain. On arrival in operation theatre, standard non-invasive monitoring was applied. All patients received injection ceftriaxone 1gm, nalbuphine 0.1 mg/kg, metoclopramide 10 mg intravenously as premedication.

General anaesthesia was achieved by standard protocols using propofol (2mg/kg) for induction, suxamethonium (2mg/kg) to facilitate intubation, maintenance with oxygen and nitrous oxide at 50%:50%, isoflurane at 1.5 MAC and muscle relaxation with atracurium 0.5mg/kg as loading dose and 0.1 mg/kg as maintenance dose repeated every 20 mins. Pneumoperitoneum was produced by insufflation of $CO_2$ at supraumblical port. Laparoscopic cholecystectomy was carried in reverse trendelenburg position using standard four ports technique by consultant surgeons with gas pressure maintained between 12-14 mm of Hg. Gall bladder was extracted through epigastric port. In the study group (Group A) 20 ml of 0.25% bupivacaine was instilled in the right subdiaphragmetic space & gall bladder bed in trendelenburg position and another 20ml of 0.25% bupivacaine for local infiltration in the port sites (5 ml infiltration in each port). Normal saline was infiltrated in the patients in control group (Group B). The residual $CO_2$ was carefully evacuated by manual compression of abdomen with open trocars at the end of the surgery. Reversal of muscle relaxation was done with neostigmine and atropine. Recovery and shifting to post operative ward was carried out according to standard protocols. Arrival

time in the postoperative ward was taken as zero hour postoperatively.

Level of pain was assessed every 2 hourly for at 6 hours postoperatively using the 10 point visual analogue scale (VAS). All patients demographic data, level of pain on VAS at 2 hrs interval postoperatively was recorded on a predesigned proforma and mean early postoperative pain score was calculated and compared in both groups.

## DATA ANALYSIS PROCEDURE:

Data was analyzed using SPSS V 10. All quantitative variables like age, postoperative pain scores were quoted as Mean ± SD. Frequency and percentages were calculated for all qualitative variables like gender and comparison of mean pain score between groups was done using student's t-test. The $p \leq 0{\cdot}05$ was regarded as statistically significant.

## RESULTS:

Age distribution of the patients showed that majority of the patients in both groups were between 41-50 years i.e. 42%(n=21) in Group-A and 38%(n=19) in Group-B. 16%(n=8) in Group-A and 12%(n=6) in Group-B were between 18-30 years and 28%(n=14) in Group-A and 24%(n=12) in Group-B were between 31-40 years of age, while 14%(n=7) in Group-A and 26%(n=13) in Group-B had >50 years of age. Mean and SD was calculated as 39.42 ± 4.27 and 37.88 ± 4.03 respectively. (Table No. 1)

Gender distribution of the patients showed 18 %( n=9) in Group-A and 28 %( n=14) in Group-B were males while 82 %( n=41) in Group-A and 72 %( n=36) in Group-B were females. (Table No. 2)

Mean pain score was recorded at 0, 2, 4 and 6 hours postoperatively. Mean pain score at 0 hour was 2.28 ± 0.99 in Group-A and 2.26 ± 0.98 in Group-B; p value was recorded as 0.90, which is insignificant. Similarly, there was no significant difference (p=0.068) between the groups regarding mean pain score at 2 hours which was recorded as 4.580 ± 0.57 in group A and 4.808 ± 0.80 in Group B respectively. However, there was significant difference between groups regarding mean pain score at 4 and 6 hours. Mean pain score at 4 hour was 4.20 ± 0.80 in group A and 5.86 ± 0.94 in group B (p=0.000) while at 6 hour it was 5.02 ± 0.91 in group A and 7.16 ± 1.36 in group B (p=0.000). (Table 3)

**TABLE No. 1: AGE DISTRIBUTION OF THE PATIENTS (n=100)**

| **Age(in years)** | **Group-A (n=50)** | | **Group-B (n=50)** | |
|---|---|---|---|---|
| | **No. of patients(n)** | **%** | **No. of patients(n)** | **%** |
| 18-30 | 8 | 16 | 6 | 12 |
| 31-40 | 14 | 28 | 12 | 24 |
| 41-50 | 21 | 42 | 19 | 38 |
| >50 | 7 | 14 | 13 | 26 |
| **Total** | **50** | **100** | **50** | 100 |
| **Mean and SD** | **39.43 ± 4.27** | | **37.88 ± 4.03** | |

**TABLE No. 2: GENDER DISTRIBUTION OF THE PATIENTS (n=100)**

| **Gender** | **Group-A (n=50)** | | **Group-B (n=50)** | |
|---|---|---|---|---|
| | **No. of patients(n)** | **%** | **No. of patients(n)** | **%** |
| Male | 9 | 18 | 14 | 28 |
| Female | 41 | 82 | 36 | 72 |
| **Total** | **50** | **100** | **50** | **100** |

**TABLE No. 3: COMPARISON OF MEAN PAIN SCORE IN BOTH GROUPS (n=100)**

| TIME INTERVAL (hours) | GROUP-A (n=50) | GROUP-B (n=50) | p-VALUE |
|---|---|---|---|
| 0 hour | 2.28 ± 0.99 | 2.26 ± 0.98 | 0.920(insignificant) |
| 2 hour | 4.580 ± 0.57 | 4.808 ± 0.80 | 0.068(insignificant) |
| 4 hour | 4.20 ± 0.80 | 5.86 ± 0.94 | 0.000(significant) |
| 6 hour | 5.02 ± 0.91 | 7.16 ± 1.36 | 0.000(significant) |

## DISCUSSION:

Many benefits reported after laparoscopic surgery explain its increasing success in all surgical fields mostly general and gynecological surgery. Laparoscopic cholecystectomy (LC) has become a gold standard surgical procedure for removal of the gall bladder. [2,10] Some benefits of laparoscopic cholecystectomy include cosmetic scar, less blood loss and shorter hospital stay. Although laparoscopic cholecystectomy results in less postoperative pain and reduced analgesic consumption as compared with open cholecystectomy, it is not a pain free procedure. [11-13]

The origin, intensity, character and duration of pain after laparoscopic cholecystectomy are variable and complex. According to some clinicians, primary source of somatic pain is surgical incision for the placement of trocars through abdominal wall. Visceral pain arises from insufflation of $CO_2$ causing irritation of diaphragm & stretching of nerve endings and intraperitoneal dissection for removal of gall bladder from the liver bed. Finally, shoulder pain secondary to stretching of sub diaphragmatic fibers of the phrenic nerve as a result of $CO_2$ pneumoperitoneum is a frequent postoperative observation after laparoscopy (35% to 60%). [4,14-18] During early hours after LC, more intense pain is experienced by the patients and greater analgesia is required. This pain can delay rapid recovery and ambulation thus decreasing cost effectiveness of the procedure. [19,20]

Non-steroidal anti-inflammatory drugs (NSAID's), opioids are usually used for post-operative pain management after laparoscopic cholecystectomy. The choice of various drugs, their undesirable effects, the timing, doses as well as different routes of their administration prevent introducing general recommendations in daily practice of a particular institution. [21] Moreover, treatment with NSAID's and opioids for post laparoscopy pain yields controversial results. [8]

Local anaesthetics are very important class of drug used for pain relief after laparoscopic cholecystectomy. They are safe, effective, and easy to administer and free of opioids side effects. Infiltration of port sites with local anaesthetics is effective and widely practiced. [22] Intraperitoneal injections of long acting local anaesthetics like bupivacaine, ropivacaine have been proposed to provide effective analgesia following laparoscopic cholecystectomy but they are not yet standardized. Several reports are available on the efficacy of intraperitoneal administration of local anaesthetic for analgesia after laparoscopic surgery. [3-8,20,23] The rationale of using intraperitoneal local anaesthetic(IPLA) in laparoscopic surgery is that local anaesthetics reduce nociception by inhibiting the release and actions of prostaglandins and

effecting nerve membrane associated proteins. [24] Chu PT [25], Sarac [16], in their studies reported reduction in intensity of pain after puncture sites were infiltrated with local anaesthetics where as Ure [26] did not find any reduction in pain using preincisional bupivacaine infiltration. Gupta et al. [19] used 20 ml of 0.5% bupivacaine intraperitoneally at the end of laparoscopic cholecystectomy. They reported reduced pain scores and decreased analgesic requirement as compared to control group in which 20 ml of 0.9% normal saline was used as placebo.

We designed this randomized controlled trial considering that local scientific publications lack data regarding port site & intraperitoneal use of bupivacaine for pain relief after laparoscopic cholecystectomy and this prospective study can be used as local reference and encourage routine use of IPLA in our daily practice. More number of patients (100) is followed for 6 hours after laparoscopic cholecystectomy which is duration of maximum pain intensity. We used 40 ml of 0.25 % bupivacaine (100 mg), 20 ml for intraperitoneal administration and 20 ml for port sites infiltration (5 ml at each). This dose of bupivacaine is considered to be effective and also safe through these routes resulting in plasma concentration of bupivacaine below toxic level. [6,19]

The results of our study revealed lower pain scores in both groups at 0 and 2 hour after laparoscopic cholecystectomy but comparison of mean pain score between two groups at 0 (p=0.920) and 2 (p=0.068) hours did not yield any significant difference. There was significantly lower mean pain scores (p=0.000) in study group as compared to control group at 4 and 6 hours postoperatively.

The findings of the study are in agreement with a recent study by Alam et al. [8] showing lower pain scores (6.08 ± 0.40) in early postoperative period after laparoscopic cholecystectomy with port site & intraperitoneal use of 0.25 % bupivacaine as compared to control group (8.44 ± 0.51) in which no bupivacaine is used. Maharjan SK and Shrestha S [20] studied the analgesic efficacy of intraperitoneal and periportal injection of bupivacaine following laparoscopic cholecystectomy and concluded that intraperitoneal and periportal injection of bupivacaine is effective in decreasing pain after laparoscopic cholecystectomy and resulted in reduced analgesic requirements. Two consecutive studies carried out by Johnson et al. [27] using intraperitoneal and periportal injection of bupivacaine after completion of surgery reported intraperitoneal use of bupivacaine an effective technique for decreasing postoperative pain after laparoscopic cholecystectomy. The addition of NSAID's was having no additional benefit.

The results of the study are in agreement with other above mentioned studies and also justify the hypothesis of the study that "mean early postoperative pain score following laparoscopic cholecystectomy is significantly less in study group (port site & intraperitoneal bupivacaine) as compared to control group".

Early post-operative pain experienced by the patients must be relieved if laparoscopic cholecystectomy is to become a routine ambulatory procedure. It increases the patients comfort and satisfaction. Use of both port site and intraperitoneal bupivacaine should be encouraged routinely as a part of multimodal analgesia thus helping to improve clinical outcome and cutting down hospital costs.

## CONCLUSION:

We concluded that the use of port site and intraperitoneal bupivacaine is simple, safe, non-invasive and effective in decreasing early postoperative pain after laparoscopic cholecystectomy and it should be carried out routinely thus benefiting all patients undergoing elective laparoscopic cholecystectomy.

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